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Changes in objective dry eye diagnostic tests after upper eyelid blepharoplasty

Effect of blepharoplasty on objective dry eye

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Abstract

Aim: In this study, we aimed tto evaluate the effect of upper eyelid blepharoplasty performed by removing the orbicular strip in patients with only functional visual complaints on objective dry eye tests.

Material and Methods: In our ophthalmology clinic, this retrospective study included 46 eyes of 23 individuals who underwent upper eyelid blepharoplasty for grade 3 lateral dermatochalasis with associated visual complaints between October 2021 and June 2022. Schirmer test and tear break-up time (BUT) were measured preoperatively and postoperatively at three months in all individuals. In addition, the effects of upper eyelid blepharoplasty on objective dry eye tests (Schirmer test and BUT) were evaluated.

Results: The mean value of the preoperative Schirmer's test was 17.3 mm, while the postoperative 3rd-month measurements were 17.42 mm. In addition, the preoperative BUT measurements of our patients were 11.43 seconds, while the postoperative 3rd-month measurements were 11.38 seconds (p:0.268).

Discussion: Upper eyelid blepharoplasty performed by removing the orbicular muscle strip in grade 3 dermatochalasis patients with only functional visual complaints may not affect objective dry eye tests in the postoperatively third month.

Keywords

Upper Eyelid Blepharoplasty, Schirmer Test, Dry Eye Test, Dry Eye

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Introduction

Dermatochalasis is a redundant eyelid skin that may compose a "hooding" impact, possibly influencing and narrowing the visual field [1]. Upper eyelid dermatochalasis is primarily associated with the aging process, genetic factors, and effects of ultraviolet exposure. Because of the anatomic and functional changes, patients experience visual field narrowing and cosmetic concerns [2,3]. Therefore, upper eyelid blepharoplasty is one of the most common cosmetic procedures that improve the esthetic appearance and functional visual field [1]. Also, upper eyelid blepharoplasty is performed to repair the aesthetic view of the periorbital area and improve visual field narrowing. This procedure is usually carried out under local anesthesia. It includes the removal of redundant skin, orbital fat, and commonly the removal of a different amount of orbicularis oculi muscle strip. This surgery has considerably increased patients' quality of life through improved visual function and cosmetic appearance [4,5].

Upper eyelid blepharoplasty achieves satisfactory esthetic outcomes; however, performing upper eyelid blepharoplasty can cause the development or aggravation of dry eye (DE) symptoms in some individuals, reported ranging from 0% to 26.5% in some studies [6,7]. The development of dry eye after upper eyelid blepharoplasty is associated with various factors, for example, temporary postoperative lagophthalmos [7]. Although after upper eyelid blepharoplasty DE is a relatively uncommon and temporary complication, the intensity of DE symptoms could affect life quality [8,9]. However, some patients may develop permanent, chronic DE syndrome, severely affecting their mental and physical situation. Also, quality-of-life studies have demonstrated that DE may affect visual acuity [4]. The development of DE after upper eyelid blepharoplasty is associated with various situations, including temporary postoperative transient lagophthalmos is the most common one. Also, in a few patients, DE can become permanent, continuing well beyond the period of any transient postoperative lagophthalmos or even in its beginning absence [7]. The exact cause of postoperative DE is still uncertain; a better understanding is needed. Since upper eyelid blepharoplasty procedure frequently involves resectioning the orbicularis oculi muscle strip (responsible for eyelid closure), some studies hypothesize that the change of blink forces might be a trigger factor for DE. Alternations in upper eyelid anatomy and motion dynamics could be attributed to the development of DE following upper eyelid blepharoplasty [6,7,10].

Alternations in eyelid structure and motion dynamics could be featured in the development of DE following upper eyelid blepharoplasty. The other opinion is that postoperative DE triggered by upper eyelid blepharoplasty is related to the decrease of tear film stability. Some possible mechanisms contributing to this idea have been suggested: the unstable distribution of tear film caused by the alternation in the interplay between the ocular surface and the upper eyelid [7,11,14]

To the best of our knowledge, several studies on the development of DE after blepharoplasty can be found in the literature [6,7,13]. However, we have yet to find a study that analyzed the effect of blepharoplasty performed for only visual complaints on objective dry eye tests. Upper eyelid blepharoplasty can be associated with DE since the function of the orbicularis oculi muscle can influence the tear film stability. The present study aims to evaluate the effect of upper eyelid blepharoplasty performed by removing the orbicular strip in patients with only functional visual complaints on objective dry eye tests.

Material and Methods

The present study included 23 (21 females, 2 males) patients who underwent upper eyelid blepharoplasty for visual complaints between October 2021 and June 2022. Electronic medical records of the Egepol Hospital Ophthalmology Clinic were reviewed to identify all patients who underwent upper eyelid blepharoplasty for uncomplicated dermatochalasis. In addition, we reviewed files retrospectively; after three months, 23 patients (mean age 57.5 years, range 51–67) were evaluated. All patients had grade 3 lateral severe dermatochalasis according to Silva's new classification and only with coexisting visual complaints [15]. The present study was carried out with the permission of the Bakircay University Training and Research Hospital, Clinical Researches Ethics Committee (Date: 29.07.2022, Decision No: 673). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. Written consent was obtained from the patient participating in this study for the use of her photograph. Before the surgery, the individuals underwent a complete ophthalmologic examination, including biomicroscopic examination, fundus examination, and best-corrected visual acuity. In addition, all patients underwent the tear break up time [BUT] test and Schirmer's test measurements before the operation and again 3 months after surgery. The Schirmer test was performed without using topical anesthesia. Schirmer test strips (Akschirmer-India) were placed on the outer 1/3 of the lower eyelid. At the end of the fifth minute, values of 10 mm and above were considered normal [16]. After the Schirmer test, sterile fluorescein strips (Fluoro Touch-India) were placed on the lower eyelid fornix for BUT measurements. The patients were asked to blink three times and then look straight without blinking in the dye on the cornea under biomicroscopic examination at x10 magnification with a cobalt blue filter [17]. The time between the last blink and the first dry spot was measured. This measurement was repeated three times, the average of these three measurements was taken, and values of 10 seconds and above were considered normal [18].

The exclusion criteria included neuromuscular abnormalities, a history of ocular surgery and previous eyelid surgery within four months, contact lens wear, or ocular/eyelid diseases such as lagophthalmos, glaucoma, acute inflammation or infection, Sjögren's syndrome, Stevens-Johnson syndrome, and thyroid eye disease. Also, patients with grade 1-2 lateral dermatochalasis with concomitant cosmetic complaints or visual complaints incomplete and grade 3 lateral dermatochalasis coexisting cosmetic complaints were excluded from the study.

The bilateral upper eyelid crease was marked as the lower border of the skin tissue to be excised, approximately 8-9 mm above the upper lid margin. As its upper edge is about 10 mm below the lower part of the eyebrow, a pinch test was performed with forceps to avoid excessive resection. Local anesthesia with 1-2 ml of 0.5% lidocaine with 1:100.000 epinephrine was

applied to both eyelids. The incision was made with a 15-blade scalpel, and the excess skin was dissected from the underlying tissue with the help of curved tissue scissors. Afterward, approximately 5-6 mm wide orbicular tissue was removed with scissors. Hemostasis was achieved using electrocautery. The skin incision was closed with a continuous intradermal nonabsorbable suture (nylon 7/0).

All results were statistically analyzed using SPSS software (version 21.0, IBM Corp, Armonk, NY, USA). The statistical analysis for the differences between preoperative and postoperative BUT and the Schirmer test was conducted using the mean value of both eyes of the individuals. For statistical analysis, the Wilcoxon rank test was used. A p-value of 0.01 or less was considered statistically significant.

Ethical Approval

Ethics Committee approval for the study was obtained.

Results

The present study included 46 eyes of 23 patients who underwent bilateral upper eyelid blepharoplasty for grade 3 dermatochalasis coexisting visual complaints in our clinic between October 2021 and June 2022. The mean age of patients (21 females, 2 males) was 57.5 years (range 51–67). Preoperative and postoperative third-month photographs of a typical patient who underwent upper eyelid blepharoplasty are presented in Figure 1.

The assessment of the individuals' Schirmer's test results showed that, preoperatively, the mean measurement was 15.90±2.05 mm, whereas, postoperatively, the mean measure was 15.64±1.92 mm in the third month. The Schirmer's test measurements in the third postoperative month were lower than all the preoperative measurements. But this was not statistically significant (Table 1).

The assessment of the individuals' BUT results showed that the preoperative measure was 16.40±2.80 seconds. Postoperatively, it was 15.95±3.05 seconds in the third month. Accordingly, it was observed that no significant differences were observed at the third-month visit compared to the preoperative measurements (Table 1).

Table 1. Preoperative and postoperative Schirmer test and BUT measurements.

	Preoperative	Postoperative	P
Schirmer's Test	15.90 mm	15.64 mm	(p:0.256)
BUT	16.40 sec	15.95 sec	(p:0.268)

Figure 1. Preoperative and postoperative third-month photographs of a typical patient who underwent upper eyelid blepharoplasty.

Discussion

With the effect of aging and gravity, dermatochalasis develops due to the relaxation of the subcutaneous tissue along with the eyelid skin. Dermatochalasis develops when the eyelid skin and subcutaneous tissue lose their elasticity due to aging and gravity. Excess skin, loose subcutaneous tissue, and adipose tissue due to aging make people to look older and more tired than they are. Blepharoplasty is a treatment method with high patient satisfaction and surgical success. For this reason, blepharoplasty has become the most frequently applied facial plastic surgery. During upper eyelid blepharoplasty, excess skin, orbital fat, and/or orbicular muscle are resected. Changes in the upper lid anatomy may lead to altered objective dry eye test results and dry eye development after upper eyelid blepharoplasty. The incidence of dry eye after upper eyelid blepharoplasty varies between 0-12.9% in some studies [6,7].

Black et al. [19] defined a transient decrease in eyelid sensation after upper eyelid blepharoplasty and attributed this reduction to trigeminal nerve injury during surgery. Besides direct nerve injury, the corneal surface sensation can also be reduced because of inflammation. Decreased ocular surface sensation results in reduced tear production [14,15]. In a previous research assessing tear production and ocular surface sensation in individuals who underwent upper eyelid blepharoplasty, Kim et al.[25] demonstrated that ocular surface sensation was decreased in the postoperative first week and turned back to preoperative results after the first month. We considered that the Schirmer test, which is associated with tears production, and BUT that assesses tear film stability, might have been temporarily decreased, especially in the early postoperative period, as a result of reduced blinking reflex, inadequate blinking, and temporary meibomian gland dysfunction caused by postoperative inflammation and preoperative local anesthetics. Opposite to other studies, they followed a rise in Schirmer test measurements in the first month. Yan et al.[21] also demonstrated increased Schirmer tests and BUT results in the first week after upper eyelid blepharoplasty. It is usually thought that aesthetic upper eyelid blepharoplasty, mainly resecting the orbicularis oculi muscle, might alter the balance of eyelid closure, tear distribution, and tear pumping, causing a reduced tear secretion and blink rate [14,22]. Kim et al. [20] showed a significant increase in the Schirmer test after one month postoperatively in 11 individuals. They showed no significant difference in tear production after one day postoperatively, but found increased tear production in the first postoperative month. These findings differed from the present study, but the present study had a longer follow-up period. Lima et al.[23] evaluated preoperatively and three months postoperatively rose bengal staining, BUT, Schirmer's test, dry eye symptoms in 29 individuals after upper eyelid blepharoplasty procedure. Their outcome was similar to the present study, with no difference in BUT between the preoperative period and the third month after surgery. Opposite to the present study, the authors observed significant differences in Schirmer's test measurements at postoperative assessment. Aksu et al.[24] determined no considerable change in postoperative Schirmer test results after a levator surgery. The statistically significant reduction in the upper eyelid blepharoplasty group proposes a

mechanism connected with the orbicularis oculi muscle. They suggested that Orbicularis strip resection is thought to weaken the orbicularis oculi muscle, decrease the blinking reflex arc, and reduce ocular sensation and tear production due to injury to trigeminal nerve branches in a reduction in basal and reflex tear secretion. These findings do not support our results. In the present study, we demonstrated a decrease in the Schirmer test and BUT test results, but this was not statistically significant. We evaluated objective dry eye tests postoperatively for three months in the present study. This suggested that orbicular muscle healing, functional improvement, and all inflammatory process could be completed after three months. Regeneration of orbicularis oculi muscle by 4–6 months postoperatively could permit improvement of normal blink function. After selectively devastating the orbicularis muscle in rabbits, Wirtschafter et al. [25] demonstrated complete healing of the orbicularis at six months. The present study showed that after upper eyelid blepharoplasty, orbicularis oculi function about tear production and tear film dynamics could reach enough effect postoperatively in the 3rd month.

As retrospective research, the present study has some limitations. The number of individuals included in the present study was limited. Other limitations are short follow-up time and few parameters. In addition, there are different surgical techniques that determine the width of the orbicularis oculi muscle resection to be performed. Another limitation of the present study is the absence of histological parameters concerning dry eye, corneal and conjunctival surface alternation. Therefore, there is a need for a long-term follow-up period and prospective controlled studies in large patient series to achieve a concurrence concerning the amount of optimal orbicularis oculi muscle resection and histological parameters that would change objective dry eye tests and disclosure of the mechanisms that may reason dry eye.

Conclusion

In conclusion, to the best of our knowledge, this is the first study that evaluated the effect of upper eyelid blepharoplasty performed by removing the orbicular strip in patients with only functional visual complaints on objective dry eye tests. The present study showed that upper eyelid blepharoplasty performed by removing the orbicular muscle strip in grade 3 lateral dermatochalasis patients with only functional visual complaints might not affect objective dry eye tests in the postoperatively third month.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.

References

1. Pemberton JD, Salter M, Fay A, Thuro B, Spencer H, Dajani O. Investigation of Goldmann perimetry in evaluation of patients for upper eyelid blepharoplasty. Orbit. 2018;37(1):48–52.

2. Nagi KS, Carlson JA, Wladis EJ. Histologic assessment of dermatochalasis: elastolysis and lymphostasis are fundamental and interrelated findings. Ophthalmology. 2011;118(6):1205-10.

3. Shirado M. Dyslipidaemia and age-related involutional blepharoptosis. J Plast Reconstr Aesthet Surg. 2012;65(6):46-50.

4. Jacobsen AG, Brost B, Vorum H. Functional benefits and patient satisfaction with upper blepharoplasty-evaluated by objective and subjective outcome measures. Acta Ophthalmol. 2017;95(8):820–5.

5. Chen WP. Visual, physiological, and aesthetic factors and pitfalls in asian blepharoplasty. Aesthetic Surg J. 2016; 36(3):275–83.

6. Hamawy AH, Farkas JP, Fagien S. Preventing and managing dry eyes after periorbital surgery: a retrospective review. Plast Reconstr Surg. 2009;123(1):353–9.

7. Prischmann J, Sufyan A, Ting JY, Ruffin C, Perkins SW. Dry eye symptoms and chemosis following blepharoplasty: a 10-year retrospective review of 892 cases in a single-surgeon series. JAMA Facial Plast Surg. 2013;15(1):39–46.

8. Asiedu K, Dzasimatu SK, Kyei S. Impact of dry eye on psychosomatic symptoms and quality of life in a healthy youthful clinical sample. Eye Contact Lens. 2018;44(2):404–9.

9. Gomes JAP, Azar DT, Baudouin C, Efron N, Hirayama M, Horwath-Winter J, et al. TFOS DEWS II iatrogenic report. Ocular Surface. 2017; 15(3):511– 38.

10. Saadat D, Dresner SC. Safety of blepharoplasty in patients with preoperative dry eyes. Arch Facial Plastic Surg. 2004; 6(2):101–4.

11. Bron AJ, de Paiva CS, Chauhan SK, Bonini S, Gabison EE, Jain S, et al. TFOS DEWS II pathophysiology report. Ocular Surface. 2017; 15(3):438– 510.

12. Jie Y, Sella R, Feng J, Gomez ML, Afshari NA. Evaluation of incomplete blinking as a measurement of dry eye disease. Ocular Surface. 2019;17(3):440-6.

13. Pacella SJ, Codner MA. Minor complications after blepharoplasty: dry eyes, chemosis, granulomas, ptosis, and scleral show. Plastic Reconstructive Surg. 2010;125(2):709–18.

14. Zhang SY, Yan Y, Fu Y. Cosmetic blepharoplasty and dry eye disease: a review of the incidence, clinical manifestations, mechanisms and prevention. Int J Ophthalmol. 2020; 13(3):488–92.

15. Rossi Santos Silva K, Cardoso Rossi D, Petroianu A. A New Classification of the Lateral Dermatochalasis of Upper Eyelids. Plast Reconstr Surg Glob Open. 2021;9(7):37-42.

16. Chiang B, Asbell PA, Franklin B. Phenol red thread test and Schirmer test for tear production in normal and dry eye patients. Invest Ophthalmol Vis Sci. 1988;29(3):337-45.

17. Pflugfelder SC, Tseng SC, Sanabria O, Kell H, Garcia CG, Felix C, et al. Evaluation of subjective assessments and objective diagnostic tests for diagnosing tear-film disorders known to cause ocular irritation. Cornea. 1998;17(1):38-56.

18. Doğru M. New Developments in Dry Eye Diagnosis. MN Oftalmoloji. 2016;23(1):15-19.

19. Black EH, Gladstone GJ. Eyelid sensation after supratarsal lid crease incision. Ophthal Plast Reconstr Surg. 2002;18(1):45-49.

20. Kim HH, DePavia CS, Yen MT. Effects of upper eyelid blepharoplasty on ocular surface sensation and tear production. Can J Ophthalmol. 2007;42(2):739- 42.

21. Yan Y, Zhou Y, Zhang S, Cui C, Song X, Zhu X, et al. Impact of full-incision double-eyelid blepharoplasty on tear film dynamics and dry eye symptoms in young Asian females. Aesthetic Plastic Surgery. 2020;44(6):2109-16.

22. Yang P, Ko AC, Kikkawa DO, Korn BS. Upper eyelid blepharoplasty: evaluation, treatment, and complication minimization. Semin Plastic Surg. 2017; 31(1):51–7.

23. Lima CG, Siqueira GB, Cardoso IH, Sant'Anna AE, Osaki MH. Evaluation of dry eye in before and after blepharoplasty. Arq Bras Oftalmol. 2006; 69(2):227–32.

24. Aksu Ceylan N, Yeniad B. Effects of Upper Eyelid Surgery on the Ocular Surface and Corneal Topography. Turk J Ophthalmol. 2022;52(2):50-56.

25. Wirtschafter JD, Slovut DP, Stordal L, et al. Severe but temporary injury to rabbit orbicularis oculi muscle using dihematoporphyrin ether and laser photochemomyectomy. Mov Disord. 1992;7(2):171–7.

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